



**MEMORANDUM:**

**Date:** September 29, 1995

**Subject:** Review of State Regulations Potentially Impacting Stationary Reciprocating Internal Combustion Engine (RICE) Emissions

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**To:** RICE NSPS/NESHAP Project Files

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The objective of the task described in this memo was to determine which states have adopted regulations that either:

- (1) mandate emission controls for stationary internal combustion engines; or
- (2) set maximum allowable concentrations for nitrogen oxides, sulfur oxides, particulates, HAP's and/or other air pollutants found in RICE exhaust streams.

The principal source used to gather the information described in this memo was the Environment Reporter. No California laws or regulations were listed in the Environment Reporter index under the four topic headings investigated (see below). The EPA Research Triangle Park library and those local law libraries contacted (UNC-CH Law School and NC Supreme Court Library) contain neither the complete updated California Administrative Code nor a compilation of all local Air Pollution Management District (APMD) rules. While sources of California regulations governing RICE emissions are being pursued, no regulations other than the South Coast, Santa Barbara County, and Ventura County APMD rules provided by ESD have yet been obtained. For this reason, only three California regulations governing RICE emissions are summarized below.

The Environment Reporter State Airs Laws and Regulations Index has several topic headings that reference state regulations potentially impacting RICE. The topic headings investigated to locate existing state laws governing RICE emissions were as follows:

Combustion Engines: Emissions;  
Internal Combustion Engines: Emissions;  
Stationary Sources: New Sources; and

## Fuel Burning Equipment: Emissions.

Whether internal combustion engines are affected by a particular regulation referenced under "fuel burning equipment" was determined by checking the definition of "fuel burning equipment" contained in the regulation (if provided). If the regulation provides a definition of "fuel burning equipment" which indicates that the primary purpose of such equipment is to burn fuel to provide an indirect heat source, the regulation does not apply to internal combustion engines. (Note: The Colorado, Georgia, Illinois, Indiana, Michigan and New Jersey regulations indexed under "fuel burning equipment" each provided definitions excluding internal combustion engines from the terms of the regulation). The Arizona, Oklahoma, and Maryland emission standards indexed under fuel burning equipment are summarized below. The Arizona and Oklahoma standards do not include definitions for fuel burning equipment, and the Maryland standard applies to "fuel burning equipment and internal combustion engines."

In addition to the Arizona, Oklahoma and Maryland emission standards, regulations from Delaware, Minnesota, New Jersey, North Dakota, Texas and Wisconsin, and from the South Coast, Santa Barbara County, and Ventura County APMD's are also summarized below. The Delaware and Texas regulations establish limits for NO<sub>x</sub> emissions from stationary internal combustion engines; the Texas regulation also establishes limits for CO emissions. The Minnesota, New Jersey, and Wisconsin regulations establish opacity limits for visible stationary internal combustion engine exhaust streams; the Minnesota regulation also establishes limits for sulfur dioxide. The North Dakota regulation is a general prohibition against "obnoxious or noxious gases, fumes or vapor" being emitted from any internal combustion engine. The three sets of California APMD rules all establish emission limits for NO<sub>x</sub>, Reactive Organic Gases, and CO.

### **Arizona Air Regulation R-18-2-503 Standards of Performance for existing fossil-fuel fired steam generators and general fuel burning equipment**

The regulation applies to:

- (1) installations in which fuel is burned for the primary purpose of producing power (where) the products of combustion do not come into direct contact with process materials; and
- (2) general fuel burning equipment with a capacity of 73 megawatts or greater.

The standard sets maximum allowable particulate emission limits (expressed in pounds mass per hour) of:

- (1)  $1.02 Q^{0.769}$  for equipment with a heat input rate equal to or less than 4200 million Btu/hr, and

- (2)  $17.0 Q^{0.432}$  for equipment with a heat input rate greater than 4200 million Btu/hr

where Q is heat input (expressed in million Btu/hr).

The standard sets maximum allowable sulfur dioxide emissions as follows:

Low sulfur fuel

- (1) 1.0 pounds SO<sub>2</sub> maximum per three-hour average per million Btu for facilities whose construction or modification began prior to May 30, 1972; and
- (2) 0.8 pounds SO<sub>2</sub> maximum per three-hour average per million Btu for all other facilities burning low sulfur fuel.

High sulfur fuel

2.2 pounds of SO<sub>2</sub> maximum per three-hour average per million Btu for all facilities.

### **Delaware Air Regulation No. 12-Control of Nitrogen Oxide Emissions**

Section 3 of the regulation contains standards for nitrogen oxide emissions from stationary (reciprocating) internal combustion engines.

Section 3.4 sets as maximum allowable nitrogen oxide emission rates from stationary RICE at those (rates) achieved using pre-ignition chamber or clean burn technology for gas fired units and those achieved using lean burn technology (adjusting the air/fuel mixture to reduce NO<sub>x</sub> emissions) for diesel fired units. (Note: the Clean Air Act definitions of emission rates for pre-ignition chamber or clean burn technology are referenced).

### **Maryland Air Regulation 26.11.009 Control of Fuel Burning Equipment and Stationary Internal Combustion Engines**

The regulation sets opacity limits for internal combustion engines which are defined as all engines except those used for propulsion of ships, licensed on-road motor vehicles), or engines employed solely for agricultural and recreational purposes, unless an integral part of a stationary installation. Separate opacity limits are set for engines during idle and operating conditions. The limits are as follows:

- (1) Engines during idle mode cannot discharge emissions with greater than 10 percent opacity or darker in shade or appearance than that designated as number 1/2 on the Ringelmann Smoke Chart; and

- (2) Engines during operating mode cannot discharge emissions greater than 40 percent opacity or darker in shade or appearance than that designated as number 2 on the Ringelmann Smoke Chart.

### **Minnesota Air Regulation 7005.2200 Standards of Performance for Stationary Internal Combustion Engines**

The regulation sets opacity limits and sulfur dioxide emission limits for stationary internal combustion engines. These limits are as follows:

- (1) Emissions of visible air contaminants greater than 20 percent opacity for more than ten consecutive seconds are prohibited, once operating temperatures are obtained;
- (2) Emissions of any gases containing sulfur dioxide in excess of 1.75 pounds per million Btu actual heat input are prohibited:
  - (a) from engines located in the Minneapolis-St. Paul air control region or
  - (b) from engines with a total rated heat input greater than 250 million Btu per hour located anywhere else in Minnesota.

### **New Jersey State Air Regulation 7:27-3.4. Smoke Emissions From Stationary Reciprocating Internal Combustion Engines**

The regulation prohibits emission of smoke darker than No. 1 on the Ringelmann Smoke Chart or greater than 20 percent opacity (exclusive of visible condensed water vapor), occurring for a period greater than 10 consecutive seconds.

### **North Dakota Air Regulation 33-15-08-01. Internal Combustion Engine Emissions Restricted.**

The regulation states:

No person shall operate, or cause to be operated, any internal combustion engine which emits from any source any unreasonable and excessive smoke, obnoxious or noxious gases, fumes or vapor.

### **Oklahoma Air Regulation 310:200-33-2. Emission Limits**

The regulation establishes the following emission limits for fuel combustion sources:

- (1) No new gas fired fuel burning equipment with a rated heat input of 50 million btu's/hour shall emit NO<sub>x</sub> in excess of 0.20 pounds/ million btu input.

- (2) No new liquid fired fuel burning equipment with rated heat input of 50 million btu's/hour shall emit NO<sub>x</sub> in excess of 0.30 pounds/ million btu input.

### **Texas Regulation VII: Control of Air Pollution from Nitrogen Compounds**

The regulation includes sections regulating nitrogen oxide emissions from reciprocating internal combustion (engines) in commercial, institutional, and industrial source use. For purposes of the regulation the following definitions apply:

**Lean-burn engine:** A spark-ignited or compression-ignited, Otto cycle, diesel cycle, or two-stroke engine that is operated with an exhaust stream oxygen concentration of 4.0% by volume, or greater, as determined from the uncontrolled exhaust stream.

**Major source:** Any stationary source or group of sources located within a contiguous area and under common control that emits or has the potential to emit:

- (1) at least 25 tons per year of NO<sub>x</sub> and is located in the Houston/Galveston ozone nonattainment area;
- (2) at least 50 tons per year of NO<sub>x</sub> and is located in the Beaumont/Port Arthur ozone nonattainment area.

**Nitrogen oxides:** The sum of the nitric oxide and nitrogen dioxide in the flue gas or emission point, collectively expressed as nitrogen dioxide.

**Rich-burn engine:** A spark-ignited, Otto cycle, four-stroke, naturally aspirated or turbocharged engine that is operated with an exhaust stream oxygen concentration of less than 4.0% by volume.

**Stationary IC engine:** A reciprocating engine either attached to a foundation or if not so attached is operated or is intended to be operated at a single facility for more than six months, including any replacement engine for a specific application which lasts or is intended to last for more than six months.

Section 117.201 includes emission specifications for the following stationary internal combustion engines used in a commercial, institutional, or industrial application (that is a major source) located within the Houston/Galveston and Beaumont/Port Arthur ozone nonattainment areas:

Stationary internal combustion engines located in the Houston/Galveston ozone nonattainment area with a hp rating of 150 hp or greater; or located in the Beaumont/port Arthur ozone nonattainment area with a hp rating of 300 hp or greater.

The emission limitations for the covered internal combustion engines are as follows:

Gas-fired, rich-burn stationary reciprocating internal combustion engines shall not emit  $\text{NO}_x$  in excess of a block one-hour average of 2.0 grams  $\text{NO}_x$  per horsepower hour and shall not emit CO in excess of a block one-hour average of 3.0 g CO per horsepower hour.

**Wisconsin State Air Regulation NR 485.05 Visible emission limits motor vehicles, internal sources, and mobile sources.**

The regulation prohibits visible emissions from 25 hp or greater gasoline internal combustion for periods of 5 consecutive seconds or longer.

**South Coast Air Quality Management District Rule 1110.2 (amended December 9, 1994) Emissions from Gaseous- and Liquid- Fueled Internal Combustion Engines**

The regulation requires that all stationary engines over 50 brake horse power and all portable engines over 100 bhp be replaced with an electric motor or meet emission limits for CO,  $\text{NO}_x$  and reactive organic gases (ROG) established by the regulation. Eight exemptions exist for certain types and locations of ICE use. The regulation establishes the following maximum allowable emission levels for CO,  $\text{NO}_x$ , and ROG from affected ICE's (all measured by volume corrected to 015 percent oxygen on a dry basis and averaged over 15 minutes):

2000 PPM for CO;  
36 PPM for  $\text{NO}_x$ ; and  
250 PPM for ROG, measured as methane.

**Santa Barbara County Air Pollution Control District Rule 333. Control of Emissions from Reciprocating Internal Combustion Engines (revised 12/10/91)**

The rule applies to all engines with a rated brake horsepower of 50 or greater that are fueled by natural gas, field gas, liquefied petroleum gas, diesel fuel, gasoline or any other liquid fuel. Engines operated less than 200 hours per calendar year or that operate on a fuel consisting of 75 percent or more (by volume) of landfill gas, determined on an annual basis, are exempt from the rule.

The following definitions apply in the rule:

**Cyclic engine:** An engine that under normal operating conditions varies in shaft load by 40 percent or more of rated bhp during recurrent periods of 30 seconds or less, or is used to power an oil well reciprocating pumping unit;

**Noncyclic engine:** Any engine which is not a cyclic engine;

**Lean-burn engine:** A spark-ignited or compression ignited, Otto-cycle, Diesel cycle or two-stroke engine that is operated with an exhaust stream oxygen concentration of 4 percent by volume, or greater. The exhaust gas oxygen content shall be determined from the uncontrolled exhaust stream.

**Rich-burn engine:** A spark-ignited, Otto-cycle, or a four-stroke naturally aspirated engine that is operated with an exhaust stream oxygen concentration of less than 4 percent by volume. The exhaust gas oxygen content shall be determined from the uncontrolled exhaust stream.

The rule establishes the following maximum allowable emission levels for CO, NO<sub>x</sub>, and ROG from affected ICE's:

**Noncyclic Rich Burn Engines Maximum Emission Limits by Oxygen Level**

Pollutant	15% Oxygen ppmv	3% Oxygen ppmv
NO <sub>x</sub>	50	152
ROG	250	758
CO	4,500	13,653

**Noncyclic Lean Burn Engine Maximum Emission Limits by Oxygen Level**

Pollutant	15% Oxygen ppmv	3% Oxygen ppmv
NO <sub>x</sub>	125	380
ROG	750	2,275
CO	4,500	13,653

**Cyclic Engine Maximum Emission Limits by Oxygen Level**

Pollutant	15% Oxygen ppmv	3% Oxygen ppmv
NO <sub>x</sub>	50	152
ROG	250	758
CO	4,500	13,653

Alternately, NO<sub>x</sub> emissions may be reduced by at least 90% of the uncontrolled emissions across the control device.

Diesel engines shall not exceed 8.4 grams per bhp-hour of oxides of nitrogen or the following maximum limits as corrected for oxygen:

Pollutant	15% Oxygen ppmv	3 % Oxygen ppmv
NO <sub>x</sub>	797	2,400

**Ventura County Air Pollution Control District Rule 74.9. Stationary Internal Combustion Engines (revised 12/21/93)**

The rule applies to any stationary internal combustion engine rated at 50 or more hp, operated on any gaseous fuel, including liquid petroleum gas (LPG), or diesel fuel, and not subject to the provisions of Rule 74.16.

After January 1, 1997, maximum NO<sub>x</sub>, ROG, and CO concentrations allowed in affected internal combustion engine exhausts are as follows:

Engine Type	NO <sub>x</sub> ppmv	ROG ppmv	CO ppmv
Rich-burn, general	25	250	4,500
Lean-burn, general	45	750	4,500
Diesel	80	750	4,500
Rich-burn, waste gas	50	250	4,500
Lean-burn, waste gas	125	750	4,500

In lieu of compliance with the above NO<sub>x</sub> emission limits, engines may achieve and maintain a percent NO<sub>x</sub> reduction by volume limit specified below, as measured concurrently across an emission control device:

Rich-burn, general	96 percent
Lean-burn, general	94 percent
Diesel	90 percent